

## CHAPTER 6 DOCUMENTING PROJECT COSTS

### 6-1. General.

a. This chapter provides more detailed information on documenting project costs in the RA report, expanding on concepts presented in Chapter 4 (Paragraph 4-9). For environmental restoration projects, project costs should be reported using primarily the RA (for RA capital and operating costs) and O&M (for post-RA costs) work breakdown structures, which are intended to coincide with the RA and O&M phases of the remedial response process. The use of the RA WBS will help provide RA cost data for input into HCAS. Cost reporting templates for HCAS data entry are provided in Appendix D of this guide. The data from these templates will be input by the USACE HTRW CX into the HCAS software upon receiving the RA report. Cost data should be documented in Appendix B of the RA report.

#### **Actual vs. Estimated Costs**

Often, especially at sites involving groundwater remediation, the actual costs associated with the RA will not be available at the time the RA report is being written. In addition, costs may not be available at PRP sites, or because of claims and change orders, which may not be settled until many years after RA completion. In these cases, the best available estimated costs should be used.

b. Each project typically uses a project-specific WBS to roll up costs. For the purposes of upward reporting of costs in a standardized manner in the RA report, these costs must be mapped from the project-specific WBS to the standard HTRW RA WBS. This will permit a standardized roll up of costs for nationwide historical cost input to the HCAS database.

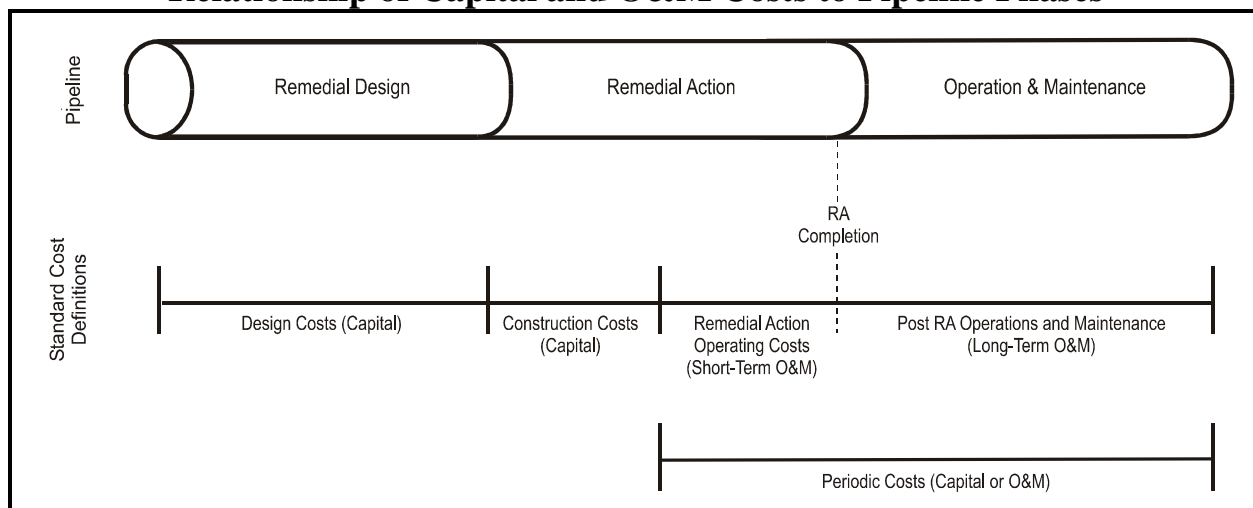
**6-2. Definitions.** The types of costs to document in the RA report include capital, O&M (RA operating and post-RA O&M), and periodic costs. These are defined below. Figure 6-1 illustrates the relationship of these costs to the RA and O&M phases.

a. Capital costs are those expenditures that are required to construct the RA. They are exclusive of the costs required to operate or maintain the action throughout its lifetime. Capital costs consist primarily of expenditures initially incurred to build or install the remedial action (e.g., construction of a groundwater treatment system and related site work). Capital costs include all labor, equipment, and material costs, including contractor markups such as overhead and profit, associated with construction activities. The RA WBS should be primarily used to report capital costs. Capital costs can also include expenditures for professional/technical services that are necessary to support construction of the RA.

b. O&M costs are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial action. O&M costs documented in the RA report can include RA operating costs and post-RA O&M costs. The RA WBS should be primarily used to report RA operating costs and the O&M WBS should be primarily used to estimate post-RA O&M costs. O&M costs include all labor, equipment, and material costs, including contractor markups such as overhead and profit, associated with O&M activities. O&M costs can also include expenditures for professional/technical services necessary to support O&M activities.

c. Periodic costs are those capital or O&M costs that occur only once every few years (e.g., five-year reviews, equipment replacement) or expenditures that occur only once during the entire O&M period or remedial timeframe (e.g., site close out). Periodic costs can be incurred during the RA operating period, but are more likely to be incurred during the post-RA O&M period. Either the RA or O&M WBS can be used to report periodic costs.

**Exhibit 6-1**  
**Relationship of Capital and O&M Costs to Pipeline Phases**



**6-3. Cost Element Structure.** All applicable capital, O&M, and periodic costs should be documented in the RA report. To help identify the cost element structure to report costs; capital, O&M, and periodic cost elements are described in Exhibits 6-2, 6-3, and 6-4, respectively. Exhibits 6-2 and 6-3 includes second-level elements from the HTRW RA and O&M work breakdown structures, respectively, for construction and O&M activities. Professional/technical services and institutional controls have been added to the descriptions in Exhibits 6-2 and 6-3; however, these costs are not reported into HCAS. More information on the RA and O&M work breakdown structures is provided below.

a. The RA WBS, Account 33XXX, includes construction (RA capital) and operation during the remedial action (RA operating). Account 33XXX excludes all project management at all phases and excludes pre construction investigations and remedial design. Account 33XXX excludes post construction O&M, which is in Account 34XXX.

b. The O&M WBS, Account 34XXX, includes post construction O&M (post RA O&M), which is long term, indefinite term, or caretaker status following remedial action. Account 34XXX includes such items as operation labor and equipment, maintenance and repair, fuel, utilities, bulk chemicals, raw materials, plant ownership/rental, plant upgrades and replacements, transport waste materials to the plant, preparation and handling of waste materials at the plant, training, regulatory approvals, etc.

**6-4. Capital Cost Elements.** The majority of the capital cost elements listed in Exhibit 6-2 are construction activities (e.g., sitework) that are incurred as part of the physical construction of the RA. Project management, remedial design, and construction management are

professional/technical services to support construction of the remedial action. Institutional controls, which are legal or administrative measures used to limit or restrict site access, can be a major component of the RA (if required) and therefore warrant separate consideration. Contingency is not included as a separate cost element since the costs reported in the RA report are known, or actual, RA costs.

## **Exhibit 6-2**

### **RA Capital and Operating Cost Elements**

<b>Cost Element</b>	<b>Description</b>
<b>331XX.01 Mobilization and Preparatory Work</b>	Includes all preparatory work required during remedial action or construction. This includes submittals; construction plans; mobilization of personnel, facilities and equipment; construction of temporary facilities; temporary utilities; temporary relocations and setup of decontamination facilities and construction plant.
<b>331XX.02 Monitoring, Sampling, Testing, and Analysis</b>	Provides for all work during remedial action associated with air, water, sludge, solids and soil sampling, monitoring, testing, and analysis. Includes sample taking, shipping samples and sample analysis by on-site and off-site laboratory facilities.
<b>331XX.03 Sitework</b>	Sitework during remedial action consists of site preparation, site improvements, and site utilities. Site preparation includes demolition, clearing, and earthwork. Site improvements include roads, parking, curbs, gutters, walks and other hardscaping. Site utilities include water, sewer, gas, other utility distribution. Also includes new fuel storage tanks. All work involving contaminated or hazardous material is excluded from this system. Storm drainage involving contaminated surface water is included under "Surface Water Collection and Control" (331XX.05). Note that topsoil, seeding, landscaping and reestablishment of existing structures altered during remediation activities are included in "Site Restoration" (331XX.20).
<b>331XX.04 Ordnance and Explosive-Chemical Warfare Material Removal and Destruction</b>	Includes the locating, removing, and destruction of all ordnance, conventional or chemical, fused or unfused, related scrap, propellants, and delivery vehicles during remedial action. Providing for public involvement, providing subsurface data for the delineating the extent of the contamination. Also includes the construction of temporary explosive storage bunkers and surveys.
<b>331XX.05 Surface Water Collection and Control</b>	Provides for the collection and control of contaminated surface water through the construction of storm drainage piping and structures, erosion control measures, and civil engineering structures such as berms, dikes and levees. Includes the collection of surface water through the construction of lagoons, basins, tanks, dikes, and pump systems. Includes transport to treatment plant.
<b>331XX.06 Groundwater Collection and Control</b>	Provides for the remedial action collection and control of contaminated groundwater through the construction of piping, wells, trenches, slurry walls, sheet piling and other physical barriers. Includes the collection of groundwater through the construction of lagoons, basins, tanks, dikes, and pump systems. Includes transport to treatment plant.
<b>331XX.07 Air Pollution/Gas Collection and Control</b>	Includes the remedial action construction for the collection and control of gas, vapor and dust.

### Exhibit 6-2, cont. RA Capital and Operating Cost Elements

Cost Element	Description
<b>331XX.08 Solids Collection and Containment</b>	Provides for exhuming and handling of solid hazardous, toxic and radioactive waste (HTRW) during remedial action through excavation, sorting, stockpiling, and filling containers. Provides for containment of solid waste through the construction of multilayered caps as well as dynamic compaction of burial grounds, cribs, or other waste disposal units. Includes transport to treatment plant.
<b>331XX.09 Liquids/Sediment/Sludge Collection and Containment</b>	Includes collection during remedial action of HTRW-contaminated liquids and sludges through dredging and vacuuming, and the furnishing and filling of portable containers. Includes the containment of liquids and sludges through the construction of lagoons, basins, tanks, dikes, and drain system. Includes transport to treatment plant.
<b>331XX.10 Drums/Tanks/Structures/Miscellaneous Demolition and Removal</b>	Includes the demolition and removal during remedial action of HTRW contaminated drums, tanks, contaminated paint removal, and other structures by excavation and downsizing. Does not include filling portable hazardous waste containers or transport of wastes to treatment or disposal facilities. See "Solids Collection and Containment" (331XX.08), "Disposal (Other than Commercial)" (331XX.18), and "Disposal (Commercial)" (331XX.19)
<b>331XX.11 Biological Treatment</b>	Includes operation (separate items for each subsystem technology) of the plant facility during the remedial action phase, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (331XX.11.(01.-14.)). Includes a separate item for the construction of a permanent plant facility, including permanent treatment equipment which is purchased for one project only (331XX.11.50.). Biological treatment is the microbial transformation of organic compounds. Biological treatment processes can alter inorganic compounds such as ammonia and nitrate, and can change the oxidation state of certain metal compounds. Includes in-situ biological treatment such as land farming as well as activated sludge, composting, trickling filters, anaerobic, and aerobic digestion. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (331XX.05.11, 331XX.06.08, 331XX.08.03 or 331XX.09.04).
<b>331XX.12 Chemical Treatment</b>	Includes operation (separate items for each subsystem technology) of the plant facility during the remedial action phase, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (331XX.12.(01.-14.)). Includes a separate item for the construction of a permanent plant facility, including permanent treatment equipment which is purchased for one project only (331XX.12.50.). Chemical treatment is the process in which hazardous wastes are chemically changed to remove toxic contaminants from the environment. Type of treatment included in this system are oxidation/reduction, solvent extraction, chlorination, ozonation, ion exchange, neutralization, hydrolysis, photolysis, dechlorination, and electrolysis reactions. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (331XX.05.11, 331XX.06.08, 331XX.08.03 or 331XX.09.04).

**Exhibit 6-2, cont.**  
**RA Capital and Operating Cost Elements**

Cost Element	Description
<b>331XX.13</b> <b>Physical Treatment</b>	Includes operation (separate items for each subsystem technology) of the plant facility during the remedial action phase, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (331XX.13.(01.-32.)). Includes a separate item for the construction of a permanent plant facility, including permanent treatment equipment which is purchased for one project only (331XX.13.50.). These treatment processes are the physical separation of contaminants from solid, liquid or gaseous waste streams. The treatments are applicable to a broad range of contaminant concentrations. Physical treatments generally do not result in total destruction or separation of the contaminants in the waste stream, consequently post-treatment is often required. Type of physical treatment included in this system are filtration, sedimentation, flocculation, precipitation, equalization, evaporation, stripping, soil washing, and carbon adsorption. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (331XX.05.11, 331XX.06.08, 331XX.08.03 or 331XX.09.04).
<b>331XX.14</b> <b>Thermal Treatment</b>	Includes operation (separate items for each subsystem technology) of the plant facility during the remedial action phase, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (331XX.14.(01.-07.)). Includes a separate item for the construction of a permanent plant facility, including permanent treatment equipment which is purchased for one project only (331XX.14.50.). Thermal treatment is the destruction of wastes through exposure to high temperature in combustion chambers and energy recovery devices. Several processes capable of incinerating a wide range of liquid and solid wastes include fluidized bed, rotary kiln, multiple hearth, infrared, circulating bed, liquid injection, pyrolysis, plasma torch, wet air oxidation, supercritical water oxidation, molten salt destruction, and solar detoxification. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (331XX.05.11, 331XX.06.08, 331XX.08.03 or 331XX.09.04).
<b>331XX.15</b> <b>Stabilization/Fixation/ Solidification</b>	Includes operation (separate items for each subsystem technology) of the plant facility during the remedial action phase, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (331XX.15.(01.-07.)). Includes a separate item for the construction of a permanent plant facility, including permanent treatment equipment which is purchased for one project only (331XX.15.50.). Stabilization/fixation/encapsulation processes attempt to improve the handling and physical characteristics of the wastes, decrease the surface area, limit the solubility of any pollutants and detoxify contained pollutants. For transportation see "Transport to Treatment Plant" (331XX.05.11, 331XX.06.08, 331XX.08.03 or 331XX.09.04).
<b>331XX.16</b> <b>Reserved</b>	Reserved for future use.

## Exhibit 6-2, cont. RA Capital and Operating Cost Elements

Cost Element	Description
<b>331XX.17 Decontamination and Decommissioning (D&amp;D)</b>	Decontamination and decommissioning during remedial action are all activities associated with shutdown and final cleanup of a nuclear or other facility. Includes facility shutdown and dismantling activities, preparation of decommissioning plans, procurement of equipment and materials, research and development, spent fuel handling, and hot cell cleanup.
<b>331XX.18 Disposal (Other than Commercial)</b>	Includes operation (separate items for each subsystem disposal method) of the plant facility during the remedial action phase, based on the volume of waste material disposed, including portable treatment equipment which is charged on a time basis and can be used on more than one project (331XX.18.(01.-10.)). Includes a separate item for the construction of a permanent disposal facility, including permanent disposal equipment, which is purchased for one disposal facility only (331XX.18.15.). Disposal (Other than Commercial) provides for the final placement of HTRW or ordnance at facilities owned or controlled by the Government. An example would be the disposal of wastes through burial at a DOE nuclear facility or ordnance disposal at DOD facilities. Includes handling, disposal fees, and transportation to the final Destruction/Disposal/Storage facility. Excluded is the transportation to a facility for treatment prior to final disposal. For transportation prior to final disposal see "Transport to Treatment Plant" (331XX.05.11, 331XX.06.08, 331XX.08.03 or 331XX.09.04). Disposal may be accomplished through the use of secure landfills, burial grounds, trench, pits, above ground vault, underground vault, underground mine/shaft, tanks, pads (tumulus / retrievable storage, other), storage buildings or protective cover structures, cribs, deep well injection, incinerator, or other.
<b>331XX.19 Disposal (Commercial)</b>	Commercial disposal during remedial action provides for the final placement of HTRW at third party commercial facilities that charge a fee to accept waste depending on a variety of waste acceptance criteria. Fees are assessed based on different waste categories, methods of handling, and characterization. Disposal may be accomplished through the use of secure landfills, surface impoundments, deep well injection, or incineration. Includes transportation to the final Destruction/Disposal/Storage facility. Excludes transportation to a facility for treatment prior to disposal. For transportation see "Transport to Treatment Plant" (331XX.05.11, 331XX.06.08, 331XX.08.03 or 331XX.09.04).
<b>331XX.20 Site Restoration</b>	Site restoration during remedial action includes topsoil, seeding, landscaping, restoration of roads and parking, and other hardscaping disturbed during site remediation. Note that all vegetation and planting is to be included as well as the installation of any site improvement damaged or altered during construction. All vegetation and planting for the purpose of erosion control during construction activities should be placed under "Erosion Control" (331XX.05.13). Treated soil used as backfill will be placed under "Disposal (Other than Commercial)" (331XX.18). All new site improvements, those not disturbed during construction, are to be included under "Sitework" (331XX.03).

**Exhibit 6-2, cont.**  
**RA Capital and Operating Cost Elements**

<b>Cost Element</b>	<b>Description</b>
<b>331XX.21 Demobilization</b>	Provides for all work associated with remedial action plant takedown and removal of temporary facilities, utilities, equipment, material, and personnel.
<b>331XX.9x Other</b>	Includes all Hazardous, Toxic, Radioactive Waste Remedial Action work not described by the above-listed systems.
<b>Project Management</b>	Professional/technical services to support construction or installation of remedial action not specific to remedial design or construction management.
<b>Remedial Design</b>	Professional/technical services to design the remedial action, including pre-design activities to collect the necessary data.
<b>Construction Management</b>	Professional/technical services to manage construction or installation of remedial action, excluding any similar services provided as part of construction activities.
<b>Institutional Controls</b>	Non-engineering (i.e., administrative or legal) measures to reduce or minimize potential for exposure to site contamination or hazards (i.e., limit site access or restrict site access).

**6-5. O&M Cost Elements.**

a. Many of the O&M cost elements listed in Exhibit 6-3 are incurred as part of physical operation and maintenance activities. Project management and technical support are professional/technical services to support O&M activities. Institutional controls may require annual update or maintenance to ensure potential for exposure to site contamination or hazards is reduced or minimized. Contingency, which covers unknowns or unanticipated conditions associated with future O&M activities, should be added to the total of projected O&M costs (i.e., post-RA O&M), which are estimated only at the time of the RA report.

b. O&M costs can vary and may be estimated for different time periods, depending on the operating conditions and requirements. For example, the first five years of a groundwater monitoring program may require semiannual sampling, while the next twenty years may only require annual sampling. Likewise, an installed cap or cover may require more frequent inspections during the first year of O&M than during subsequent years.

### Exhibit 6-3 Post-RA O&M Cost Elements

Cost Element	Description
<b>342XX.02 Monitoring, Sampling, Testing, and Analysis</b>	Provides for all work during post construction O&M associated with air, water, sludge, solids and soil sampling, monitoring, testing, and analysis. Includes sample taking, shipping samples and sample analysis by on-site and off-site laboratory facilities.
<b>342XX.03 Sitework</b>	Post construction O&M. Sitework includes site improvements, and site utilities. Site improvements include roads, parking, curbs, gutters, walks and other hardscaping. Site utilities include water, sewer, gas, other utility distribution. Also includes fuel storage tanks. All work involving contaminated or hazardous material is excluded from this system. Storm drainage involving contaminated surface water is included under "Surface Water Collection and Control" (342XX.05).
<b>342XX.05 Surface Water Collection and Control</b>	Provides for post construction O&M of the system for the collection and control of contaminated surface water through storm drainage piping and structures, erosion control measures, and civil engineering structures such as berms, dikes and levees. Includes transport to treatment plant.
<b>342XX.06 Groundwater Collection and Control</b>	Provides for post construction O&M of the system for the collection and control of contaminated groundwater through piping, wells, trenches, slurry walls, sheet piling and other physical barriers. Includes transport to treatment plant.
<b>342XX.07 Air Pollution/Gas Collection and Control</b>	Includes the post construction O&M of the system for collection and control of gas, vapor, and dust.
<b>342XX.08 Solids Collection and Containment</b>	Provides for post construction O&M of the system for exhuming and handling of solid hazardous, toxic and radioactive waste (HTRW) through excavation, sorting, stockpiling, and filling containers. Provides for post construction O&M of multilayered caps. Includes transport to treatment plant.
<b>342XX.09 Liquids/Sediments/Sludge Collection and Containment</b>	Includes post construction O&M of the system for collection of HTRW-contaminated liquids and sludges through dredging and vacuuming, and the furnishing and filling of portable containers. Includes the post construction O&M of the system for containment of liquids and sludges through lagoons, basins, tanks, and dikes. Includes transport to treatment plant.



**Exhibit 6-3, cont.**  
**Post-RA O&M Cost Elements**

Cost Element	Description
<b>342XX.11</b> <b>Biological Treatment</b>	<p>Includes post construction O&amp;M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.11.(01.-14.)). Includes a separate item for the yearly post construction O&amp;M of a permanent plant facility (342XX.11.50.). Biological treatment is the microbial transformation of organic compounds. Biological treatment processes can alter inorganic compounds such as ammonia and nitrate, and can change the oxidation state of certain metal compounds. Includes in-situ biological treatment such as land farming as well as activated sludge, composting, trickling filters, anaerobic, and aerobic digestion. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04).</p>
<b>342XX.12</b> <b>Chemical Treatment</b>	<p>Includes post construction O&amp;M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.12.(01.-14.)). Includes a separate item for the yearly post construction O&amp;M of a permanent plant facility (342XX.12.50.). Chemical treatment is the process in which hazardous wastes are chemically changed to remove toxic contaminants from the environment. Type of treatment included in this system are oxidation/reduction, solvent extraction, chlorination, ozonation, ion exchange, neutralization, hydrolysis, photolysis, dechlorination, and electrolysis reactions. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04).</p>
<b>342XX.13</b> <b>Physical Treatment</b>	<p>Includes post construction O&amp;M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.13.(01.-32.)). Includes a separate item for the yearly post construction O&amp;M of a permanent plant facility (342XX.13.50.). These treatment processes are the physical separation of contaminants from solid, liquid or gaseous waste streams. The treatments are applicable to a broad range of contaminant concentrations. Physical treatments generally do not result in total destruction or separation of the contaminants in the waste stream, consequently post-treatment is often required. Type of physical treatment included in this system are filtration, sedimentation, flocculation, precipitation, equalization, evaporation, stripping, soil washing, and carbon adsorption. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04).</p>

### Exhibit 6-3, cont. Post-RA O&M Cost Elements

Cost Element	Description
<b>342XX.14</b> <b>Thermal Treatment</b>	<p>Includes post construction O&amp;M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.14.(01.-07.)). Includes a separate item for the yearly post construction O&amp;M of a permanent plant facility (342XX.14.50.). Thermal treatment is the destruction of wastes through exposure to high temperature in combustion chambers and energy recovery devices. Several processes capable of incinerating a wide range of liquid and solid wastes include fluidized bed, rotary kiln, multiple hearth, infrared, circulating bed, liquid injection, pyrolysis, plasma torch, wet air oxidation, supercritical water oxidation, molten salt destruction, and solar detoxification. Includes process equipment and chemicals required for treatment. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04).</p>
<b>342XX.15</b> <b>Stabilization/Fixation/ Capsulation</b>	<p>Includes post construction O&amp;M (separate for each subsystem technology) of the plant facility, based on the volume of waste material treated, including portable treatment equipment which is charged on a time basis and can be used on more than one project (342XX.15.(01.-07.)). Includes a separate item for the yearly post construction O&amp;M of a permanent plant facility (342XX.15.50.). Stabilization/fixation/encapsulation processes attempt to improve the handling and physical characteristics of the wastes, decrease the surface area, limit the solubility of any pollutants and detoxify contained pollutants. For transportation see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04).</p>
<b>342XX.18</b> <b>Disposal (Other than Commercial)</b>	<p>Includes post construction O&amp;M (separate for each subsystem disposal method) of the plant facility, based on the volume of waste material disposed, including portable treatment equipment which is charged on a time basis and can be used on more than one project (331XX.18.(01.-10.)). Includes a separate item for the yearly post construction O&amp;M of a permanent disposal facility (342XX.18.15.). Disposal (Other than Commercial) provides for the final placement of HTRW or ordnance at facilities owned or controlled by the Government. An example would be the disposal of wastes through burial at a DOE nuclear facility or ordnance disposal at DOD facilities. Includes handling, disposal fees, and transportation to the final Destruction/Disposal/Storage facility. Excluded is the transportation to a facility for treatment prior to final disposal. For transportation prior to final disposal see "Transport to Treatment Plant" (342XX.05.11, 342XX.06.08, 342XX.08.03 or 342XX.09.04). Disposal may be accomplished through the use of secure landfills, burial grounds, trench, pits, above ground vault, underground vault, underground mine/shaft, tanks, pads (tumulus / retrievable storage, other), storage buildings or protective cover structures, cribs, deep well injection, incinerator, or other.</p>
<b>342XX.9X</b> <b>Other</b>	<p>Includes all Hazardous, Toxic, Radioactive Waste post construction O&amp;M work not described by the above listed systems.</p>
<b>Contingency</b>	<p>Costs to cover unknowns, unforeseen circumstances, or unanticipated conditions associated with projected post-RA O&amp;M.</p>

**Exhibit 6-3, cont.**  
**Post-RA O&M Cost Elements**

Cost Element	Description
<b>Project Management</b>	Professional/technical services to manage O&M activities not specific to technical support listed below.
<b>Technical Support</b>	Professional/technical services to monitor, evaluate, and report progress of operation and maintenance.
<b>Institutional Controls</b>	Update or maintenance of non-engineering measures to reduce or minimize potential for exposure to site contamination or hazards.

**6-6. Periodic Cost Elements.** The periodic cost elements listed in Exhibit 6-4 include both construction or O&M-type activities and professional/technical services. Distinctions should be made between periodic costs that occur during the RA operating and post-RA O&M periods. Contingency should be added to projected periodic costs that may occur during the post-RA O&M period. Periodic costs should be rolled up into the appropriate items of the RA WBS and/or the O&M WBS.

**Exhibit 6-4**  
**RA or Post-RA O&M Periodic Cost Elements**

Cost Element	Description
<b>Remedy Failure or Replacement</b>	Construction activity to replace an installed remedy or key components of the remedy.
<b>Demobilization of On-Site Extraction, Containment, or Treatment Systems*</b>	Construction activity to dismantle or take down extraction , containment, or treatment facilities upon completion of remedial action.  * Specify extraction, containment, or treatment system. Examples include groundwater extraction system, soil vapor extraction system, groundwater treatment facility, etc. More than one system may be associated with an individual alternative.
<b>Contingency (post-RA only)</b>	Costs to cover unknowns, unforeseen circumstances, or unanticipated conditions associated with projected periodic construction/operation activities.
<b>Five-Year Reviews</b>	Professional/technical services to prepare five-year review reports (if hazardous substances, pollutants, or contaminants remain on-site above levels that allow for unrestricted use and unlimited exposure).
<b>Groundwater Performance and Optimization Study</b>	Professional/technical services to analyze and optimize on-going groundwater pump and treat systems.
<b>Remedial Action Report</b>	Professional/technical services to prepare remedial action report upon completion of RA.
<b>Institutional Controls</b>	Periodic update or maintenance of non-engineering measures to reduce or minimize potential for exposure to site contamination or hazards.

**6-7. Project Cost Appendix.** To support the summary of total project costs in the RA report (Paragraph 4-9 of this guide), cost information should be provided in an appendix to the RA report. This should include a cost breakdown and, if treatment was part of the remedy, calculation of technology-specific unit cost(s).

a. Cost Breakdown

(1) The cost breakdown should be in the form of one- to two-page table(s) that presents all RA capital and operating costs, post-RA O&M costs, and RA or post-RA O&M periodic costs, actual or projected. The table(s) should follow an activity-based format that identifies all cost elements and sub-elements using the RA WBS or O&M WBS, as applicable for each of the types of costs presented (e.g., RA capital costs, RA operating costs, post-RA O&M costs).

(2) Exhibit 6-5 provides an example of how a cost breakdown may be reported in Appendix B of the RA report for a remedial action that uses land treatment system to remediate contaminated soil. In this example, no periodic costs apply.

b. Technology-Specific Unit Cost

(1) The *Guide to Documenting and Managing Cost and Performance Information for Remediation Projects* (EPA 542-B-98-007) presents a recommended format for reporting technology-specific costs. One of the purposes of this format is to enable the calculation of a unit cost using only those items directly related to the performance of a technology. This unit cost could then be used for comparison with unit costs of other technologies. The unit cost calculation excludes all project costs associated with remediation that are not directly attributable to a specific technology. In addition, the technology-specific unit cost calculation should exclude all costs for project management, remedial design, construction management, and technical support that are typically added at the bottom of an estimate or cost breakdown.

(2) For the RA report, if treatment using one or more technologies is part of the remedy, technology-specific unit costs should be calculated and reported in the project cost appendix. The total costs and quantities used for the calculation should be clearly stated.

(3) In the example shown in Exhibit 6-5, the subtotal RA capital costs and subtotal RA operating costs would all be considered specific to land treatment, but not projected

### Cost Growth

As a project moves from the planning stage to the implementation stage, more and more becomes known about the actual costs of the project. During the course of RA projects, the expected accuracy of cost estimates ranges from about -30% to +50% for the ROD to about -10% to +15% at the time of RA bid and award to 0% at the completion of work.

Contingency is typically added to estimates at various stages to account for cost growth potential. Scope (design) contingency covers unknowns associated with an incomplete design. Bid (construction) contingency accounts for unforeseen costs that become known as construction proceeds. This amount represents a reserve for quantity overruns, modifications, change orders, claims, etc.

In addition to comparison to the ROD estimate, reporting of actual costs in the RA report allows for comparison to the bid/award estimate and assess the amount and possible causes of cost growth during implementation of the RA.

groundwater monitoring costs. As shown by the calculation in Exhibit 6-6, the unit cost for land treatment would be \$33.73 per cubic yard using a total technology-specific cost of \$273,247 and quantity treated of 8,100 cubic yards.

(4) For more detailed information on calculation of technology-specific unit cost, see the *Guide to Developing and Managing Cost and Performance Information for Remediation Projects* at <http://www.frtr.gov/cost/>.

c. HCAS Reporting. HCAS project and WBS cost breakdown forms shall be completed and included in the RA report. Exhibit 6-7 shows an example. Note that costs of project management, remedial design, construction management, and other items without WBS numbers (33 or 34 series) are not reported to HCAS.

## Exhibit 6-5 Example Cost Breakdown

ACTUAL & PROJECTED COSTS (1 of 2)					
<b>Site:</b>	U Creosote Superfund Site		<b>Description:</b> The selected treatment consisted of a land treatment system to remediate excavated site soils. All costs are expressed in 1998 dollars.		
<b>Location:</b>	Live Oak, Florida				
<b>Phase:</b>	Final RA Report (OU 2)				
<b>Date:</b>	October 27, 1998				
<b>ACTUAL RA CAPITAL COSTS:</b>					
<b>DESCRIPTION</b>	<b>QTY</b>	<b>UNIT</b>	<b>UNIT COST</b>	<b>TOTAL (1998 \$)</b>	<b>NOTES</b>
331XX HTRW Remedial Action					
.01 Mobilization and Preparatory Work					
.01 Mob Construction Equipment & Facilities	1	EA	\$8,466	\$8,466	Excavator, etc.
.03 Submittals/ Implementation Plans	1	EA	\$5,350	\$5,350	QAPP, SSHP, etc.
.04 Setup/Construct Temporary Facilities	1	EA	\$6,602	\$6,602	Roads/parking/signs, trailer
.05 Construct Temporary Utilities	1	EA	\$3,716	\$3,716	Electrical and water hookup
SUBTOTAL				\$24,134	
.03 Sitework					
.02 Clearing and Grubbing	4.0	AC	\$4,090	\$16,360	Work area
.05 Fencing	7,500	LF	\$2.89	\$21,666	
SUBTOTAL				\$38,026	
.08 Solids Collection and Containment					
.01 Contaminated Soil Excavation	8,100	CY	\$0.95	\$7,695	
.11 Biological Treatment					
.03 Construction of Land Treatment Unit					
.90 Installation of Clay Liner	7,000	CY	\$5.70	\$39,900	Impermeable layer
.91 Shaping of Retention Pond	1	EA	\$5,658	\$5,658	
.92 Installation of Subsurface Drainage	1	EA	\$48,216	\$48,216	
.93 Construction of Perimeter Berms	2,000	LF	\$5.65	\$11,300	
.94 Installation of Run-On Drainage Swales	3,000	LF	\$1.98	\$5,940	
.95 Installation of Irrigation System	1	EA	\$15,802	\$15,802	
.96 Rental of Tractor and Tiller	1	EA	\$10,653	\$10,653	
.97 Level D PPE	20	EA	\$102.60	\$2,052	Boots, hard hats, etc. for 20 people
SUBTOTAL				\$139,521	
.20 Site Restoration					
.01 Earthwork	8,100	CY	\$1.04	\$8,445	Backfill, grading
SUBTOTAL				\$8,445	
.21 Demobilization					
.01 Removal of Temporary Facilities	1	EA	\$1,651	\$1,651	Roads/parking/signs, trailer
.02 Removal of Temporary Utilities	1	EA	\$929	\$929	Electrical and water hookup
.04 Demob Construction Equipment & Facilities	1	EA	\$2,116	\$2,116	Excavator, etc.
.06 Submittals	1	EA	\$4,939	\$4,939	Post-const. reports
SUBTOTAL				\$9,635	
SUBTOTAL				\$227,456	
Project Management				18,320	
Remedial Design				34,350	
Construction Management				22,900	
<b>TOTAL RA CAPITAL COSTS</b>				<b>\$303,026</b>	

**Exhibit 6-5, cont.**  
**Example Cost Breakdown**

<b>ACTUAL &amp; PROJECTED COSTS (2 of 2)</b>					
<b>ACTUAL RA OPERATING COSTS:</b>					
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL (1998 \$)	NOTES
331XX HTRW Remedial Action					
.02 Monitoring, Sampling, Testing, & Analysis					
.13 Performance Monitoring (On-Site Lab)	1	EA	\$64,700	\$64,700	
SUBTOTAL				\$64,700	
.11 Biological Treatment					
.03 Land Treatment					
.90 Equipment Operation	1	EA	\$15,232	\$15,232	Sprayer and tiller
.91 Spread Soil	8,100	CY	\$4.76	\$38,556	Contaminated soil
.92 Maintenance/Repair	1	EA	\$4,292	\$4,292	Site vehicles
.93 Additional Costs	1	EA	\$3,251	\$3,251	Diesel fuel/fertilizer/seed cultures
SUBTOTAL				\$61,331	
SUBTOTAL				\$126,031	
Project Management				6,466	
<b>TOTAL ACTUAL RA OPERATING COSTS</b>				<b>\$132,497</b>	
<b>PROJECTED POST-RA O&amp;M COSTS:</b>					
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL (1998 \$)	NOTES
342XX HTRW Operation and Maintenance					
.02 Monitoring, Sampling, Testing, & Analysis					
.04 Groundwater Monitoring	5	EA	\$4,200	\$21,000	
SUBTOTAL				\$21,000	
<b>TOTAL PROJECTED POST-RA O&amp;M COSTS</b>				<b>\$21,000</b>	
<b>TOTAL PROJECT COST</b>					<b>\$456,523</b>

## Exhibit 6-6

### Example Technology-Specific Unit Cost Calculation

LAND TREATMENT	
RA CAPITAL COSTS:	
Solids Collection and Containment	\$7,695
Biological Treatment	\$139,521
SUBTOTAL	\$147,216
RA OPERATING COSTS:	
Monitoring, Sampling, Testing, & Analysis	\$64,700
Biological Treatment	\$61,331
SUBTOTAL	\$126,031
TOTAL TECHNOLOGY-SPECIFIC COST	\$273,247
Cubic Yards of Soil Treated	8,100
TECHNOLOGY-SPECIFIC UNIT COST (Per Cubic Yard)	\$33.73



## Exhibit 6-7

### Example HCAS Data Report and WBS Cost Breakdown

#### Historical Cost Analysis System (HCAS) Project Data Entry Form (Sheet 1)

##### Project Information

Project Name	U Creosote Operable Unit 2
Project Number	XXXX-YYYY-ZZ
Project Phase (Select one)	
Studies and Design	_____
Remedial Action	_____✓_____
Operations and Maintenance	_____
Project Note (Describe the project)	
	Landfarming treatment technology was used to remediate 8,100 cubic yards of
	PAH-contaminated soil.
	_____
	_____
	_____
	_____
	_____

##### Contract Information

Contract Number	DACW62-97-C-0100
Managing Organization	U.S. Army Corps of Engineers
Organization Name	Jacksonville District
Site Owner	Private Party
Other ID Number	_____
Prime Contractor	Cleanup, Inc.
Contract Type (Select one)	
Cost + Award Fee	_____
Cost + Base + Award Fee	_____
Cost + Fixed Fee	_____✓_____
Cost + Incentive Award	_____
Fixed Price	_____
Not Available	_____
Other	_____
Procurement Type (Select one)	
Two Step Sealed Bid	_____
Sealed Bid (IFB)	_____
Competitive Negotiation (RFP)	_____✓_____
Sole Source (SSC)	_____
Other	_____

## Exhibit 6-7, cont.

### Example HCAS Data Report and WBS Cost Breakdown

<b>Historical Cost Analysis System (HCAS)</b> <b>Project Data Entry Form (Sheet 2)</b>			
<b>Site Information</b>			
State/Country	Florida/USA		
Installation			
Site Name	Live Oak, FL		
Site Number			
EPA Region	IV		
Current Use (Select one)			
Installation Operation			
Industry Operation			
Residential			
Recreational			
Wildlife Refuge			
Waste Disposal	✓		
Administrative Office			
Commercial			
Other			
Unknown			
Future Use (Select one)			
Installation Operation			
Industry Operation			
Residential			
Recreational			
Wildlife Refuge			
Waste Disposal			
Administrative Office			
Commercial			
Other			
Unknown	✓		
<b>Point of Contact</b>			
	Data Entry Person	POC#2	POC#3
Title/Role	Contractor Estimator		
Organization	Cleanup, Inc.		
Name	E.S. Timator		
Address	123 Main St.		
City, State	Cleantown, FL		
Zip	12345		
Telephone	999-999-9999		
Fax	999-999-8888		
Email	estimator@cleanup.com		
Enter up to 3 POC's.			

## Exhibit 6-7, cont.

### Example HCAS Data Report and WBS Cost Breakdown

Historical Cost Analysis System (HCAS) Project Data Entry Form (Sheet 3)			
<b>Profile - General Characteristics</b>			
Regulatory Class CERCLA <span style="float: right;">✓</span> RCRA <span style="float: right;">_____</span> Other <span style="float: right;">_____</span> Unknown <span style="float: right;">_____</span> National Priority List Yes <span style="float: right;">✓</span> No <span style="float: right;">_____</span> Wetland Yes <span style="float: right;">_____</span> No <span style="float: right;">✓</span> Flood Plain Yes <span style="float: right;">_____</span> No <span style="float: right;">✓</span>	Public Concern Low <span style="float: right;">_____</span> High <span style="float: right;">✓</span> Historical/Archoeological Yes <span style="float: right;">_____</span> No <span style="float: right;">✓</span> Innovative Technology Yes <span style="float: right;">_____</span> No <span style="float: right;">✓</span> Size of Exclusion Zone (Acres) <span style="float: right;">4</span> Size of Area (Acres) <span style="float: right;">10</span>		
<b>Profile - Contaminants/Technical Approach</b>			
<b>Site Type</b> AG Storage Tanks UG Storage Tanks Drums/Cont <250 GA Unauth Disposl Area Facil/Bldgs Fire Train/Open Burn Firing Rnge/Open Det Pit/Trench Surf Impnd/Lagoons Lakes/Ponds/Swamp Landfill Ocean Rivers/Streams Spill/Emerg Resp Waste Pile Other	<b>Media</b> Air Equipment/Mach Groundwater Liquid Surface Water Sediment Sludge Soil Solid/Debris Struct Bldg Matls Other	<b>Contaminant</b> Nonhal VOC's Halogenated VOC's Nonhal Semi VOC's Halogen Semi VOC's Fuels Inorganics Low Lev Rad Waste High Lev Rad Waste Low Rad Mixed Wst TRU Waste CWM/OEW Asbestos Unknown Other	<b>Technical Approach</b> CWM/OEW Remvl Surf Water Control Grnd Water Control Air/Gas Control Solids Contain Liq/Sed/Sludge Cntrl Drums/Tanks Remvl Biological Treatment Chemical Treatment Physical Treatment Thermal Treatment Stab/Fix/Encap Decon & Decommish Disposal (Not Comm) Disposal Commercial Other
Pick as many Profile combinations as necessary:			
Unauth Disp Area _____ _____ _____	Soil _____ _____ _____	Fuels _____ _____ _____	Biological Treatment _____ _____ _____

## Exhibit 6-7, cont.

### Example HCAS Data Report and WBS Cost Breakdown

#### Historical Cost Analysis System (HCAS) Project Data Entry Form (Sheet 4)

##### Cost

Start Date	9/29/96
End Date	9/22/98
Number of Mods	0
Reasons for Mods (Select those applicable)	
Administrative	_____
Changes for Time or Cost	_____
Changes Requested by Government Authority	_____
Design Deficiency	_____
Differing Site Conditions	_____
Funding Level Change	_____
New Federal Regulation	_____
Other Changes	_____
Suspension or Termination of Work	_____
Value Engineering Change	_____
Variations in Estimated Quantities	_____
Variations Not Readily Identifiable During Design	_____
Cost	
Award Amount	\$399,000
Actual Amount	\$374,487
Cost Variance	-6%

##### Cost Breakdown

See next sheets.

The HCAS Cost Breakdown is structured in accordance with the February 1996 "HTRW Remedial Action Work Breakdown Structure (RA WBS)" and "HTRW O&M Work Breakdown Structure (O&M WBS)".

The next sheets show the RA WBS and O&M WBS to the Third Level as required for the HCAS cost report portion of the "RA Report".

The costs reported shall be "Burdened Costs", meaning that contractor markups, general requirements, overhead, and profit shall be included in the costs.

The complete RA WBS and O&M WBS to the Fourth Level is at:  
<http://www.FRTR.gov/cost/ec2/wbs1.html>

The HCAS 3.1 software can be downloaded from:  
<http://www.FRTR.gov/cost/ec2/index.html>

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number			DESCRIPTION	QTY	UOM	UNIT COST	COST \$
33XXX			<b>HTRW CONSTRUCTION ACTIVITIES</b>				
331XX			<b>HTRW REMEDIAL ACTION (Capital and Operating)</b>				
	01		<b>MOBILIZATION AND PREPARATORY WORK</b>				
	01	01	Mobilization of Construction Equipment and Facilities	1	EA	8,466	8,466
	01	02	Mobilization of Personnel		EA		
	01	03	Submittals/Implementation Plans	1	EA	5,350	5,350
	01	04	Setup/Construct Temporary Facilities	1	EA	6,602	6,602
	01	05	Construct Temporary Utilities	1	EA	3,716	3,716
	01	06	Temporary Relocations of Roads/Structures/Utilities		EA		
	01	07	Construction Plant Erection		EA		
	01	08	Institutional Controls		EA		
	01	09	Alternate Water Supply		EA		
	01	10	Population Relocation		EA		
	01	9X	Other (Use Numbers 90-99)				
	02		<b>MONITORING, SAMPLING, TESTING, AND ANALYSIS</b>				
	02	01	Meteorological Monitoring		EA		
	02	02	Radiation Monitoring		EA		
	02	03	Air Monitoring and Sampling		EA		
	02	04	Monitoring Wells		EA		
	02	05	Sampling Surface Water/Groundwater/Liquid Waste		EA		
	02	06	Sampling Soil and Sediment		EA		
	02	07	Sampling Asbestos		EA		
	02	08	Sampling Radioactive Contaminated Media		EA		
	02	09	Laboratory Chemical Analysis		EA		
	02	10	Radioactive Waste Analysis		EA		
	02	11	Geotechnical Testing		EA		
	02	12	Geotechnical Instrumentation		EA		
	02	13	On-Site Laboratory Facilities	1	EA	64,700	64,700
	02	14	Off-Site Laboratory Facilities		EA		
	02	9X	Other (Use Numbers 90-99)				
	03		<b>SITEWORK</b>				
	03	01	Demolition		SY		
	03	02	Clearing and Grubbing	4	ACR	4,090	16,360
	03	03	Earthwork		CY		
	03	04	Roads/Parking/Curbs/Walks		SY		
	03	05	Fencing	7500	LF	2.89	21,666
	03	06	Electrical Distribution		LF		
	03	07	Telephone/Communication Distribution		LF		
	03	08	Water/Sewer/Gas Distribution		LF		
	03	09	Steam and Condensate Distribution		LF		
	03	10	Fuel Line Distribution		LF		
	03	11	Storm Drainage/Subdrainage		LF		
	03	12	Permanent Cover Structure Over Containment Area		SF		
	03	13	Development of Borrow Pit/Haul Roads		ACR		

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number				DESCRIPTION	QTY	UOM	UNIT COST	COST \$
331XX	03	14		Fuel Storage Tanks (New)		EA		
	03	9X		Other (Use Numbers 90-99)				
	<b>04</b>			<b>ORDNANCE AND EXPLOSIVE - CHEMICAL WARFARE</b>				
	04	01		Ordnance Removal and Destruction		ACR		
	04	9x		Other (Use Numbers 90-99)				
	<b>05</b>			<b>SURFACE WATER COLLECTION AND CONTROL</b>				
	05	01		Berms/Dikes		LF		
	05	02		Floodwalls		SF		
	05	03		Levees		LF		
	05	04		Terraces and Benches		LF		
	05	05		Channels/Waterways (Soil/Rock)		LF		
	05	06		Chutes or Flumes		LF		
	05	07		Sediment Barriers		LF		
	05	08		Storm Drainage		LF		
	05	09		Lagoons/Basins/Tanks/Dikes/Pump System		ACR		
	05	10		Pumping/Draining/Collection		MGA		
	05	11		Transport to Treatment Plant		MGA		
	05	12		Earthwork		CY		
	05	13		Erosion Control		ACR		
	05	14		Development of Borrow Pit/Haul Roads		ACR		
	05	9X		Other (Use Numbers 90-99)				
	<b>06</b>			<b>GROUNDWATER COLLECTION AND CONTROL</b>				
	06	01		Extraction and Injection Wells		EA		
	06	02		Subsurface Drainage/Collection		LF		
	06	03		Slurry Walls		SF		
	06	04		Grout Curtain		SF		
	06	05		Sheet Piling		SF		
	06	06		Lagoons/Basins/Tanks/Dikes/Pump System		ACR		
	06	07		Pumping/Collection		MGA		
	06	08		Transport to Treatment Plant		MGA		
	06	09		Development of Borrow Pit/Haul Roads		ACR		
	06	9x		Other (Use Numbers 90-99)				
	<b>07</b>			<b>AIR POLLUTION/GAS COLLECTION AND CONTROL</b>				
	07	01		Gas/Vapor Collection Trench System		LF		
	07	02		Gas/Vapor Collection Well System		EA		
	07	03		Gas/Vapor Collection at Lagoon Cover		SY		
	07	04		Fugitive Dust/Vapor/Gas Emissions Control		ACR		
	07	9x		Other (Use Numbers 90-99)				
	<b>08</b>			<b>SOLIDS COLLECTION AND CONTAINMENT</b>				
	08	01		Contaminated Soil Collection	8.100	CY	0.95	7.695
	08	02		Waste Containment, Portable (Furnish/Fill)		CY		
	08	03		Transport to Treatment Plant		CY		

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number				DESCRIPTION	QTY	UOM	UNIT COST	COST \$
331XX	08	04		Radioactive Specific Waste Containment (Furnish/Fill)		CY		
	08	05		Capping of Contaminated Area/Waste Pile (Soil/Asphalt		ACR		
	08	06		Nuclear Waste Densification (Dynamic Compaction)		CY		
	08	07		Development of Borrow Pit/Haul Roads		ACR		
	08	9x		Other (Use Numbers 90-99)				
	<b>09</b>			<b>LIQUIDS/SEDIMENTS/SLUDGES COLLECTION AND</b>				
	09	01		Dredging/Excavating		CY		
	09	02		Industrial Vacuuming		CY		
	09	03		Waste Containment, Portable (Furnish/Fill)		MGA		
	09	04		Transport to Treatment Plant		MGA		
	09	05		Radioactive Specific Waste Containment (Furnish/Fill)		MGA		
	09	06		Pumping/Draining/Collection		MGA		
	09	07		Lagoons/Basins/Tanks/Pump System		ACR		
	09	08		Development of Borrow Pit/Haul Roads		ACR		
	09	9x		Other (Use Numbers 90-99)				
	<b>10</b>			<b>DRUMS/TANKS/STRUCTURES/MISCELLANEOUS</b>				
	10	01		Drum Removal		EA		
	10	02		Tank Removal		EA		
	10	03		Structure Removal		SF		
	10	04		Asbestos Abatement		SF		
	10	05		Piping and Pipeline Removal		LF		
	10	06		Radioactive Specific Waste Containment (Furnish/Fill)		CY		
	10	07		Miscellaneous Items		ACR		
	10	08		Contaminated Paint Removal		SF		
	10	9x		Other (Use Numbers 90-99)				
	<b>11</b>			<b>BIOLOGICAL TREATMENT</b>				
	11	01		Activated Sludge (Sequencing Batch Reactors)		MGA		
	11	02		Rotating Biological Contactors		MGA		
	11	03		Land Treatment/Farming (Solid Phase Biodegradation)	8.100	CY	24.80	200.852
	11	04		In-Situ Biodegradation/Bioreclamation		CY		
	11	05		Trickling Filters		MGA		
	11	06		Biological Lagoons		MGA		
	11	07		Composting		CY		
	11	08		Sludge Stabilization - Aerobic		CY		
	11	09		Sludge Stabilization - Anaerobic		CY		
	11	10		Genetically Engineered Organisms (White Rot Fungus)		CY		
	11	11		Slurry Biodegradation		CY		
	11	12		Bioventing		SF		
	11	13		Bioslurping		SF		
	11	14		Biopile (Heap Pile Remediation)		CY		
	11	50		Construction of Permanent Plant Facility		EA		
	11	9x		Other (Use Numbers 90-99)				

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number			DESCRIPTION	QTY	UOM	UNIT COST	COST \$
<b>331XX</b>	<b>12</b>		<b>CHEMICAL TREATMENT</b>				
	12	01	Oxidation/Reduction (Catalytic Oxidation, UV Ozone,		MGA		
	12	02	Solvent Extraction		MGA		
	12	03	Chlorination		MGA		
	12	04	Ozonation		MGA		
	12	05	Ion Exchange		MGA		
	12	06	Neutralization		MGA		
	12	07	Chemical Hydrolysis		MGA		
	12	08	Ultraviolet Photolysis		MGA		
	12	09	Dehalogenation (Catalytic Dechlorination)		CY		
	12	10	Alkali Metal Dechlorination		CY		
	12	11	Alkali Metal/Polyethylene Glycol (A/PEG)		CY		
	12	12	Base-Catalyzed Decomposition Process (BCDP)		CY		
	12	13	Electrolysis		MGA		
	12	14	Vapor Recovery/Reuse (Internal Combustion Engine)		CF		
	12	50	Construction of Permanent Plant Facility		EA		
	12	9x	Other (Use Numbers 90-99)				
	<b>13</b>		<b>PHYSICAL TREATMENT</b>				
	13	01	Filtration/Ultrafiltration		MGA		
	13	02	Sedimentation		MGA		
	13	03	Straining		MGA		
	13	04	Coagulation/Flocculation/Precipitation		MGA		
	13	05	Equalization		MGA		
	13	06	Evaporation		MGA		
	13	07	Air Stripping		MGA		
	13	08	Steam Stripping		MGA		
	13	09	Soil Washing (Surfactant/Solvent)		CY		
	13	10	Soil Flushing (Surfactant/Solvent)		CY		
	13	11	Solids Dewatering		CY		
	13	12	Oil/Water Separation		MGA		
	13	13	Dissolved Air Floatation		MGA		
	13	14	Heavy Media Separation		CY		
	13	15	Distillation		MGA		
	13	16	Chelation		MGA		
	13	17	Solvent Extraction		MGA		
	13	18	Supercritical Extraction		MGA		
	13	19	Carbon Adsorption - Gases		CF		
	13	20	Carbon Adsorption - Liquids		MGA		
	13	21	Membrane Separation - Reverse Osmosis		MGA		
	13	22	Membrane Separation - Electrodialysis		MGA		
	13	23	Soil Vapor Extraction		CY		
	13	24	Shredding		CY		
	13	25	Aeration		CY		
	13	26	Advanced Electrical Reactor		CY		
	13	27	Low Level Waste (LLW) Compaction		CY		
	13	28	Agglomeration		CY		



**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number			DESCRIPTION	QTY	UOM	UNIT COST	COST \$
331XX	13	29	In-Situ Steam Extraction		MGA		
	13	30	Filter Presses		MGA		
	13	31	Lignin Adsorption/Sorptive Clays		CY		
	13	32	Air Sparging		MGA		
	13	50	Construction of Permanent Plant Facility		EA		
	13	9x	Other (Use Numbers 90-99)				
	<b>14</b>		<b>THERMAL TREATMENT</b>				
	14	01	Incineration		CY		
	14	02	Low Temperature Thermal Desorption		CY		
	14	03	Supercritical Water Oxidation		MGA		
	14	04	Molten Salt Destruction		CY		
	14	05	Radio Frequency Heating		CY		
	14	06	Solar Detoxification		CY		
	14	07	High Temperature Thermal Desorption		CY		
	14	50	Construction of Permanent Plant Facility		EA		
	14	9x	Other (Use Numbers 90-99)				
	<b>15</b>		<b>STABILIZATION/FIXATION/ENCAPSULATION</b>				
	15	01	Molten Glass		CY		
	15	02	In-Situ Vitrification		CY		
	15	03	In-Situ Pozzolan Process (Lime/Portland Cement)		CY		
	15	04	Pozzolan Process (Lime/Portland Cement)		CY		
	15	05	Asphalt-Based Encapsulation		CY		
	15	06	Radioactive Waste Solidification (Grouting/Other)		CY		
	15	07	Sludge Stabilization (Aggregate/Rock/Slag)		CY		
	15	50	Construction of Permanent Plant Facility		EA		
	15	9x	Other (Use Numbers 90-99)				
	<b>16</b>		<b>RESERVED FOR FUTURE USE</b>				
	<b>17</b>		<b>DECONTAMINATION AND DECOMMISSIONING (D&amp;D)</b>				
	17	01	Pre-Decommissioning Operations		SF		
	17	02	Facility Shutdown Activities		SF		
	17	03	Procurement of Equipment and Material		SF		
	17	04	Dismantling Activities		SF		
	17	05	Research and Development (R&D)		SF		
	17	06	Spent Fuel Handling		SF		
	17	07	Hot Cell Cleanup		SF		
	17	9x	Other (Use Numbers 90-99)				
	<b>18</b>		<b>DISPOSAL (OTHER THAN COMMERCIAL)</b>				
	18	01	Landfill/Burial Ground/Trench/Pits		CY		
	18	02	Above-Ground Vault		CY		
	18	03	Underground Vault		CY		
	18	04	Underground Mine/Shaft		CY		
	18	05	Tanks		MGA		

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number			DESCRIPTION	QTY	UOM	UNIT COST	COST \$
331XX	18	06	Pads (Tumulus/Retrievable Storage/Other)		CY		
	18	07	Storage Bldgs/Protective Cvr Structures/Other Bldgs &		CY		
	18	08	Cribs		CY		
	18	09	Deep Well Injection		MGA		
	18	10	Incinerator		CY		
	18	15	Construction of Permanent Disposal Facility		EA		
	18	20	Container Handling		EA		
	18	21	Transportation to Storage/Disposal Facility		TON		
	18	22	Disposal Fees and Taxes		TON		
	18	23	Mixed Waste Storage Fees and Taxes		TON		
	18	9x	Other (Use Numbers 90-99)				
	<b>19</b>		<b>DISPOSAL (COMMERCIAL)</b>				
	19	20	Container Handling		EA		
	19	21	Transportation to Storage/Disposal Facility		TON		
	19	22	Disposal Fees and Taxes		TON		
	19	23	Mixed Waste Storage Fees and Taxes		TON		
	19	9x	Other (Use Numbers 90-99)				
	<b>20</b>		<b>SITE RESTORATION</b>				
	20	01	Earthwork	8.100	CY	1.04	8.445
	20	02	Permanent Markers		EA		
	20	03	Permanent Features		EA		
	20	04	Revegetation and Planting		ACR		
	20	05	Removal of Barriers		EA		
	20	9x	Other (Use Numbers 90-99)				
	<b>21</b>		<b>DEMOBILIZATION</b>				
	21	01	Removal of Temporary Facilities	1	EA	1,651	1,651
	21	02	Removal of Temporary Utilities	1	EA	929	929
	21	03	Final Decontamination		EA		
	21	04	Demobilization of Construction Equipment and Facilities	1	EA	2,116	2,116
	21	05	Demobilization of Personnel		EA		
	21	06	Submittals	1	EA	4,939	4,939
	21	07	Construction Plant Takedown		EA		
	21	9x	Other (Use Numbers 90-99)				
	<b>9X</b>		<b>OTHER (Use Numbers 90-99)</b>				
			<b>TOTAL AMOUNT \$</b>				<b>353.487</b>

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number				DESCRIPTION	QTY	UOM	UNIT COST	COST \$
34XXX				<b>HTRW POST CONSTRUCTION AND FINANCIAL CLOSEOUT ACTIVITIES</b>				
341XX				<b>FISCAL/FINANCIAL CLOSE ACTIVITIES</b>				
342XX				<b>HTRW OPERATION AND MAINTENANCE (POST CONSTRUCTION)</b>				
	02			<b>MONITORING, SAMPLING, TESTING, AND</b>				
	02	01		Meteorological Monitoring		EA		
	02	02		Radiation Monitoring		EA		
	02	03		Air Monitoring and Sampling		EA		
	02	04		Monitoring Wells	5	EA	4,200	21,000
	02	05		Sampling Surface Water/Groundwater/Liquid Waste		EA		
	02	06		Sampling Soil and Sediment		EA		
	02	07		Sampling Asbestos		EA		
	02	08		Sampling Radioactive Contaminated Media		EA		
	02	09		Laboratory Chemical Analysis		EA		
	02	10		Radioactive Waste Analysis		EA		
	02	11		Geotechnical Testing		EA		
	02	12		Geotechnical Instrumentation		EA		
	02	13		On-site Laboratory Facilities		EA		
	02	14		Off-site Laboratory Facilities		EA		
	02	9X		Other (Use Numbers 90-99)		EA		
	03			<b>SITework</b>				
	03	04		Roads/Parking/Curbs/Walks		SY/YR		
	03	05		Fencing		LF/YR		
	03	06		Electrical Distribution		LF/YR		
	03	07		Telephone/Communication Distribution		LF/YR		
	03	08		Water/Sewer/Gas Distribution		LF/YR		
	03	09		Steam and Condensate Distribution		LF/YR		
	03	10		Fuel Line Distribution		LF/YR		
	03	11		Storm Drainage/Subdrainage		LF/YR		
	03	12		Permanent Cover Structure Over Contaminated Area		SF/YR		
	03	14		Fuel Storage Tanks (New)		EA/YR		
	03	9X		Other (Use Numbers 90-99)				
	05			<b>SURFACE WATER COLLECTION AND CONTROL</b>				
	05	01		Berms/Dikes		LF/YR		
	05	02		Floodwalls		SF/YR		
	05	03		Levees		LF/YR		
	05	04		Terraces and Benches		LF/YR		
	05	05		Channels/Waterways (Soil/Rock)		LF/YR		
	05	06		Chutes or Flumes		LF/YR		
	05	07		Sediment Barriers		LF/YR		

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number			DESCRIPTION	QTY	UOM	UNIT COST	COST \$
342XX	05	08	Storm Drainage		LF/YR		
	05	09	Lagoons/Basins/Tanks/Dikes/Pump System		ACR/YR		
	05	10	Pumping/Draining/Collection		MGA		
	05	11	Transport to Treatment Plant		MGA		
	05	13	Erosion Control		ACR/YR		
	05	9X	Other (Use Numbers 90-99)				
	<b>06</b>		<b>GROUNDWATER COLLECTION AND CONTROL</b>				
	06	01	Extraction and Injection Wells		EA/YR		
	06	02	Subsurface Drainage/Collection		LF/YR		
	06	03	Slurry Walls		SF/YR		
	06	04	Grout Curtain		SF/YR		
	06	05	Sheet Piling		SF/YR		
	06	06	Lagoons/Basins/Tanks/Dikes/Pump System		ACR/YR		
	06	07	Pumping/Collection		MGA		
	06	08	Transport to Treatment Plant		MGA		
	06	9x	Other (Use Numbers 90-99)				
	<b>07</b>		<b>AIR POLLUTION/GAS COLLECTION AND CONTROL</b>				
	07	01	Gas/Vapor Collection Trench System		LF/YR		
	07	02	Gas/Vapor Collection Well System		EA/YR		
	07	03	Gas/Vapor Collection at Lagoon Cover		SY/YR		
	07	04	Fugitive Dust/Vapor/Gas Emissions Control		ACR/YR		
	07	9x	Other (Use Numbers 90-99)				
	<b>08</b>		<b>SOLIDS COLLECTION AND CONTAINMENT</b>				
	08	01	Contaminated Soil Collection		CY		
	08	02	Waste Containment, Portable (Furnish/Fill)		CY		
	08	03	Transport to Treatment Plant		CY		
	08	04	Radioactive Specific Waste Containment (Furnish/Fill)		CY		
	08	05	Capping of Contaminated Area/Waste Pile (Soil/Asph		ACR/YR		
	08	06	Nuclear Waste Densification (Dynamic Compaction)		CY		
	08	9x	Other (Use Numbers 90-99)				
	<b>09</b>		<b>LIQUIDS/SEDIMENTS/SLUDGES COLLECTION AND CONTAINMENT</b>				
	09	01	Dredging/Excavating		CY		
	09	02	Industrial Vacuuming		CY		
	09	03	Waste Containment, Portable (Furnish/Fill)		MGA		
	09	04	Transport to Treatment Plant		MGA		
	09	05	Radioactive Specific Waste Containment (Furnish/Fill)		MGA		
	09	06	Pumping/Draining/Collection		MGA		
	09	07	Lagoons/Basins/Tanks/Dikes/Pump System		ACR/YR		

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number			DESCRIPTION	QTY	UOM	UNIT COST	COST \$
342XX	09	9x	Other (Use Numbers 90-99)				
	<b>11</b>		<b>BIOLOGICAL TREATMENT</b>				
	11	01	Activated Sludge (Seq Batch Reactors)		MGA		
	11	02	Rotating Biological Contactors		MGA		
	11	03	Land Treatment/Farming (Solid Phase Biodegradation)		CY		
	11	04	In-Situ Biodegradation/Bioreclamation		CY		
	11	05	Trickling Filters		MGA		
	11	06	Biological Lagoons		MGA		
	11	07	Composting (Soil Pile Bioremediation)		CY		
	11	08	Sludge Stabilization - Aerobic		CY		
	11	09	Sludge Stabilization - Anaerobic		CY		
	11	10	Genetically Engineered Organisms (White Rot Fungus)		CY		
	11	11	Slurry Biodegradation		CY		
	11	12	Bioventing		SF		
	11	13	Bioslurping		SF		
	11	14	Biopile (Heap Pile Remediation)		CY		
	11	50	Post Construction O&M of Permanent Plant Facility		EA/YR		
	11	9x	Other (Use Numbers 90-99)				
	<b>12</b>		<b>CHEMICAL TREATMENT</b>				
	12	01	Oxidation/Reduction (Catalytic)		MGA		
	12	02	Solvent Extraction		MGA		
	12	03	Chlorination		MGA		
	12	04	Ozonation		MGA		
	12	05	Ion Exchange		MGA		
	12	06	Neutralization		MGA		
	12	07	Chemical Hydrolysis		MGA		
	12	08	Ultraviolet Photolysis (UV Oxidation)		MGA		
	12	09	Dehalogenation (Catalytic Dechlorination)		CY		
	12	10	Alkali Metal Dechlorination		CY		
	12	11	Alkali Metal/Polyethylene Glycol (A/PEG)		CY		
	12	12	Base-Catalyzed Decomposition Process		CY		
	12	13	Electrolysis		MGA		
	12	14	Vapor Recovery/Reuse (Internal Combustion Engine)		CF		
	12	50	Post Construction O&M of Permanent Plant Facility		EA/YR		
	12	9x	Other (Use Numbers 90-99)				
	<b>13</b>		<b>PHYSICAL TREATMENT</b>				
	13	01	Filtration/Ultrafiltration		MGA		
	13	02	Sedimentation		MGA		
	13	03	Straining		MGA		
	13	04	Coagulation/Flocculation/Precipitation		MGA		

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number			DESCRIPTION	QTY	UOM	UNIT COST	COST \$
342XX	13	05	Equalization		MGA		
	13	06	Evaporation		MGA		
	13	07	Air Stripping		MGA		
	13	08	Steam Stripping		MGA		
	13	09	Soil Washing (Surfactant/Solvent)		CY		
	13	10	Soil Flushing (Surfactant/Solvent)		CY		
	13	11	Solids Dewatering		CY		
	13	12	Oil/Water Separation		MGA		
	13	13	Dissolved Air Floatation		MGA		
	13	14	Heavy Media Separation		CY		
	13	15	Distillation		MGA		
	13	16	Chelation		MGA		
	13	17	Solvent Extraction		MGA		
	13	18	Supercritical Extraction		MGA		
	13	19	Carbon Adsorption - Gases		CF		
	13	20	Carbon Adsorption - Liquids		MGA		
	13	21	Membrane Separation - Reverse Osmosis		MGA		
	13	22	Membrane Separation - Electrodialysis		MGA		
	13	23	Soil Vapor Extraction		CY		
	13	24	Shredding		CY		
	13	25	Aeration		CY		
	13	26	Advanced Electrical Reactor		CY		
	13	27	Low Level Waste (LLW) Compaction		CY		
	13	28	Agglomeration		CY		
	13	29	In-Situ Steam Extraction		MGA		
	13	30	Filter Presses		MGA		
	13	31	Lignin Adsorption/Sorptive Clays		CY		
	13	32	Air Sparging		MGA		
	13	50	Post Construction O&M of Permanent Plant Facility		EA/YR		
	13	9x	Other (Use Numbers 90-99)				
	<b>14</b>		<b>THERMAL TREATMENT</b>				
	14	01	Incineration		CY		
	14	02	Low Temperature Thermal Desorption		CY		
	14	03	Supercritical Water Oxidation		MGA		
	14	04	Molten Salt Destruction		CY		
	14	05	Radio Frequency Heating		CY		
	14	06	Solar Detoxification		CY		
	14	07	High Temperature Thermal Desorption		CY		
	14	50	Post Construction O&M of Permanent Plant Facility		EA/YR		
	14	9x	Other (Use Numbers 90-99)				
	<b>15</b>		<b>STABILIZATION/FIXATION/ENCAPSULATION</b>				
	15	01	Molten Glass		CY		

**Exhibit 6-7, cont.**  
**Example HCAS Data Report and WBS Cost Breakdown**

WBS Number			DESCRIPTION	QTY	UOM	UNIT COST	COST \$
342XX	15	02	In-Situ Vitrification		CY		
	15	03	In-Situ Pozzolan Process (Lime/Portland Cement)		CY		
	15	04	Pozzolan Process (Lime/Portland Cement)		CY		
	15	05	Asphalt-Based Encapsulation		CY		
	15	06	Radioactive Waste Solidification (Grouting/Other)		CY		
	15	07	Sludge Stabilization (Aggregate/Rock/Slag)		CY		
	15	50	Post Construction O&M of Permanent Plant Facility		EA/YR		
	15	9x	Other (Use Numbers 90-99)				
	<b>18</b>		<b>DISPOSAL (OTHER THAN COMMERCIAL)</b>				
	18	01	Landfill/Burial Ground/Trench/Pits		CY		
	18	02	Above-Ground Vault		CY		
	18	03	Underground Vault		CY		
	18	04	Underground Mine/Shaft		CY		
	18	05	Tanks		MGA		
	18	06	Pads (Tumulus/Retrievable Storage/Other)		CY		
	18	07	Storage Bldgs/Protective Cvr Structures/Other Bldgs &		CY		
	18	08	Cribs		CY		
	18	09	Deep Well Injection		MGA		
	18	10	Incinerator		CY		
	18	15	Post Construction O&M of Permanent Disposal Fac		EA/YR		
	18	20	Container Handling		EA		
	18	21	Transportation to Storage/Disposal Facility		TON		
	18	22	Disposal Fees & Taxes		TON		
	18	23	Mixed Waste Storage Fees & Taxes		TON		
	18	9x	Other (Use Numbers 90-99)				
	<b>9X</b>		<b>OTHER (Use Numbers 90-99)</b>				
			<b>TOTAL AMOUNT \$</b>				21,000